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Anxiety Increases Sexual Arousal

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Twelve male subjects who were trained to expect tolerance-level electric shocks viewed an erotic film under three different counterbalanced conditions. In one condition, subjects viewed the erotic film in conjunction with a signal light indicating threat of shock. A second light indicated threat of shock if subjects did not achieve an erection of a certain size. A third light indicated no shock. Both anxiety-inducing shock-threat conditions increased penile response over and above the no-shock-threat condition. Furthermore, shock threat contingent on size of erection produced more arousal than noncontingent-shock threat.

There is an almost universal assumption that the primary maintaining factor in male sexual dysfunction is anxiety, specifically, performance anxiety or fear of performance, and the modal treatments employed have as a major goal the reduction of this anxiety. Masters and Johnson (1970) note a number of initial etiological pathways to erectile dysfunction, such as alcohol abuse and unfortunate, early traumatic sexual experiences; but, in regard to subsequent maintaining factors, they observe that "the prevalent roadblock is one of fear. Fear can prevent erections just as fear can increase the respiratory rate or lead to diarrhea or vomiting" (p. 196). Unfortunately, this is an assumption without evidence in either dysfunctional or normal subjects, an assumption that goes beyond the careful observations that Masters and Johnson and other clinicians have made when dealing with sexual dysfunction.

The few attempts to examine the relationship between anxiety and sexual arousal have been puzzling. In 1977, Hoon, Wincze, and Hoon showed 2-minute film sequences that were either neutral in content or that were designed to produce anxiety (vivid scenes of auto accidents) to normal women. These films were followed by 2-minute erotic film sequences. Exposure to the anxiety-producing film sequences, compared to preexposure to a neutral film, subsequently resulted in increases rather than decreases in sexual arousal, measured by vaginal blood flow, during the viewing of the erotic film. Wolchik et al. (1980) replicated this study, in part, with functional males. Approaching the issue from another perspective, Lange, Wincze, Zwick, Feldman, and Hughes (1981) induced a physiological state similar to clinical anxiety by injecting normal subjects with epinephrine prior to viewing an erotic film. No effects were noted during the film, although after the erotic stimulus was discontinued, detumescence was faster in the epinephrine condition when compared to a control condition.

The phenomenon of anxiety's increasing rather than decreasing sexual arousal has actually been an oft-noted clinical and experimental observation. For example, Ramsey (1943), in a study of adolescent boys, reported that about 50% of the boys noted erections from some type of nonerotic stimulus. The situations in which the nonerotic responses occurred usually involved elements of fear, excitement, or other emotionally laden circumstances. Barfield and Sachs (1968) produced increased sexual arousal in rats using electric shock. This phenomenon has also been observed in some paraphilias because many exhibitionists or voyeurs, for example, find it impossible to get sexually aroused without first experiencing fear or anxiety about being apprehended. Stoller (1976) provides a theoretical rationale to ac-

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count for these findings in his analysis of sexual excitement.

Despite this diverse literature, Wolpe (1978) correctly pointed out that increases in sexual arousal subsequent to an anxiety-producing event such as a film (as in the Hoon et al. [1977] or Wolchik et al. [1980] studies) might be due to an anxiety-relief or contrast effect (Hoon et al., 1977) rather than a facilitory effect of anxiety. In social–psychological paradigms, Bryne, Przybyla, and Infantino (Note 1) have referred to increases in attraction following a social threat as possibly due to negative reinforcement. Thus, in examining the relationship of anxiety and sexual arousal, it is important to devise an anxiety-inducing situation that can be presented simultaneously with an erotic stimulus. The first purpose of this experiment was to examine this relationship by presenting subjects with a threat of shock concurrent with viewing an erotic stimulus.

When clinicians speak of anxiety inhibiting sexual arousal, most often they talk about a specific accompanying cognitive set, frequently termed *performance demand* (Kaplan, 1974; Masters & Johnson, 1970). Nevertheless, as with anxiety in general, there is no experimental evidence supporting the inhibiting effect of this particular cognitive set. For example, Farkas, Sine, and Evans (1979) observed no effects from instructions to normal males indicating that other people found the film the subjects were about to see very arousing. Similarly, Lange et al. (1981) told subjects to "try to achieve an erection as quickly, as fully, and for as long as they could" (p. 449) when watching an erotic film, but they observed no effects from these instructions compared to instructions not to focus on obtaining an erection. On the other hand, Rosen, Shapiro, and Schwartz (1975) observed few effects from instructions alone but noticed marked increases in penile tumescence during biofeedback and contingent monetary rewards. Other biofeedback experiments (e.g., Hatch, 1981) seem to indicate that men can increase erectile response when trying to. These data also run counter to clinical observations of performance demand, where trying is reported to produce detumescence. It is possible, of course, that these instructions were too weak to simulate performance demand and that, in any case, performance demand is only operative within the context of heightened, generalized anxiety.

A second purpose of this experiment was to examine the effect of strong performance-demand instructions within the context of a generalized, anxiety-producing situation.

Method

Subjects

Twelve white, heterosexual (Kinsey rating = 0) males between the ages of 21 and 30 years (mean age = 26.25, SD = 3.6) served as subjects for the present study. Subjects were recruited by means of signs on campus offering men payment to participate as subjects for research on sexual arousal. All subjects were prescreened through an initial interview and a series of questionnaires to determine if they met the standard research criteria for functional sexual behavior. All 12 subjects signed detailed consent forms and each was paid $10. None refused to participate.

Measures

Physiological measurement. A mechanical strain gauge (Barlow, Becker, Leitenberg, & Agras, 1970) was used to assess penile circumference changes during all conditions. Heart rate was measured continuously with Beckman electrodes attached to the subject's chest and forearm. Skin conductance response was measured from a subject's middle finger and forefinger with Beckman silver–silver-chloride electrodes.

Subjective measurement. A continuous measure of subjective sexual arousal was recorded by a mechanical lever that a subject moved through a 90° arc to produce a continuous DC signal calibrated to a scale from 0 to 100. Previous work has shown that using this device does not interfere with genital arousal except at extremely low levels (Wincze, Venditti, Barlow, & Mavissakalian, 1980).

Anxiety and arousal ratings. Ratings of sexual arousal and anxiety on a 0–100 scale were obtained 1 minute after film offset for each condition.

Data sampling and analysis. All data from the heart rate, skin response, subjective rating lever, and penile measures were recorded by a Grass Model 7P1 polygraph and were simultaneously sampled and processed by an LSI-11 microprocessor. The computer continuously sampled and stored data (calculating means for each measure every 15 sec), timed and controlled administration of stimuli, and determined that poststimulus return to baseline had occurred prior to the initiation of the next condition. Penile data were scored as millimeters of circumference change from baseline, based on a presession and postsession calibration of the strain gauge on a graduated plastic cone. Heart rate data were reduced to beats per minute, skin conductance level was measured in mhos, and subjective arousal was a rating from 0 to 100.

Procedure

Shock training. The experimenter explained to the subject that it was necessary to establish an individual shock-tolerance level for each participant in the experiment. We conducted this part of the procedure in order to convince subjects that there was a realistic possibility of their receiving shocks during the session and as a way of teaching them to anticipate signaled shocks. A spot on the subject's right ventral forearm was cleaned with alcohol and lightly rubbed with fine-grained sandpaper in order to minimize skin resistance and to decrease intersubject resistance variability. Two shock electrodes were attached to the prepared area and held in place with a Velcro strap. The experimenter then explained to the subject that it was necessary to determine his shock-tolerance level and that he would be receiving shocks that would be increasing in intensity. The subject was instructed to tell the experimenter when he had reached the most intense shock that he was willing to tolerate. The experimenter then began delivering shocks, generated by a Grass SD–9 stimulator, starting with a 1-mA shock and progressing in 1.5-mA steps until tolerance or 14 mA was reached. All shocks were of a 20-msec duration and the shock levels were predetermined based on guidelines provided by the Grass Instrument Company, and Butterfield (1975). No subject reached the 14-mA maximum, and the average tolerance level was 7 mA (SD = 2.6 mA).

Experimental session. Subjects were tested individually. After the equipment was attached, the experimenter explained the meaning of each of the three signal lights located above the television monitor. One light was used to signal to the subject that there was a 60% chance of his receiving an electric shock during the time that the light was on (noncontingent-shock threat). Another light signaled to the subject that his level of arousal was being evaluated continuously, and while this light was on there was a 60% chance of electric shock if his level of arousal was less than that of the average research subject at that point in the film (contingent-shock threat). The last light was described as having no meaning, and subjects were told that because the experiment was computer controlled it was necessary to occasionally turn on a light (no-shock threat).

Three previously equated, moderately arousing, 3-minute sex film sequences were used as stimuli, and the order of presentation of the films was counterbalanced. All subjects experienced each of the three signal light conditions, in a random order, for a full 2 minutes. A film slide reminded them of the meaning of the signal lights, and no shocks were actually delivered during this phase of the experiment. After 2 minutes signal lights were turned off, but subjects continued to view the erotic film for the last minute. This last condition was implemented to look for possible anxiety-relief effects on sexual arousal following the cessation of the lights signaling shock.

Debriefing. Each subject was debriefed to ascertain that he had correctly understood the instructions and believed the explanation of the signal lights, to explain the deception, and to gather further reports on his experiences.

Results

The 3-minute periods of exposure to each experimental condition were divided into twelve 15-second epochs. Figure 1 presents the average penile circumference changes across all 12 epochs for each of the three experimental conditions: no-shock threat (NS), noncontingent-shock threat (NCS), and contingent-shock threat (CS). These data show greater increases in penile circumference under the CS condition, followed by the NCS condition, with the NS condition producing the least arousal. A repeated-measures analysis of variance was performed on the maximum circumference value attained for each of the three conditions. This analysis included a test of the assumption of equal variance–covariance matrices. Following these analyses, Duncan multiple range follow-up tests were utilized for post hoc comparisons.

The repeated-measures analysis indicated a significant condition effect, $F(2, 22) = 3.95$, $p < .05$. The test for compound symmetry revealed that the assumption of equal variance–covariance matrices had not been violated ($p < .6554$, $df = 11$), and the post hoc analyses revealed that both the CS and NCS conditions significantly differed from the NS condition but did not differ from each other ($p < .05$).

A similar repeated-measures analysis of variance for the cognitive lever revealed significant increases during all three conditions with no differences in subjective arousal among conditions. Similarly, no significant conditions effect was noted for either the heart rate or the galvanic skin response data. This may have been due to the strong effect of sexual arousal on these two measures, overshadowing any effect of shock threat that might exist as a function of the different conditions. Finally, turning off the signal lights 2 minutes into the film had no apparent effect on the data.

Extensive debriefing revealed that the experimental instructions were understood by the subjects, and all subjects reported after debriefing that the shock-threat conditions induced mild to moderate anxiety. Comments during debriefing supported trends in the data. For example, one subject reported

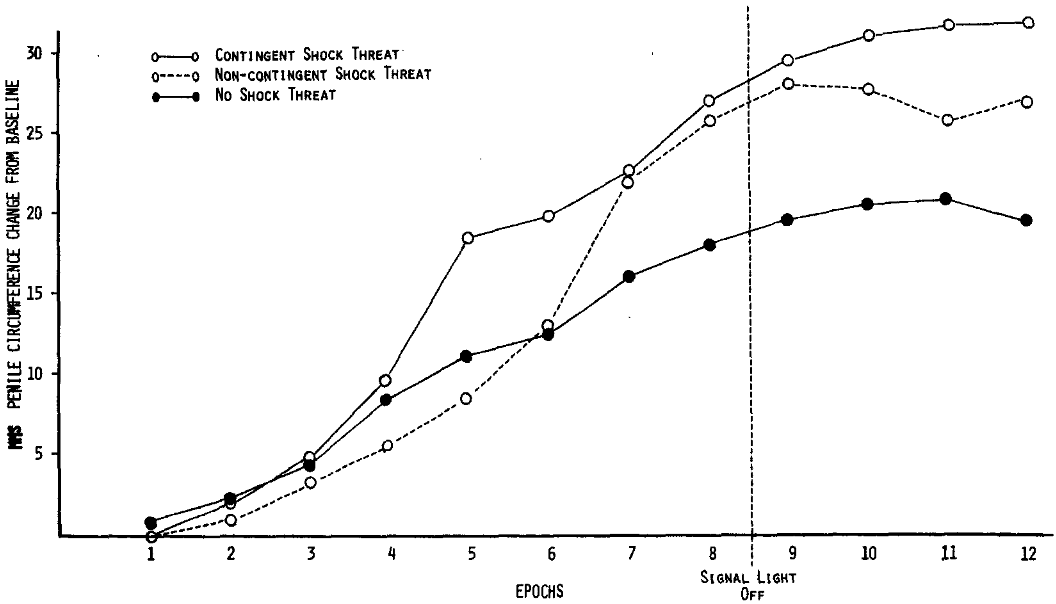

Figure 1. Average penile circumference change for each 15-sec epoch during each of three conditions: no-shock threat (NS), noncontingent-shock threat (NCS), and contingent-shock threat (CS).

after debriefing that he was quite surprised by his reactions during the experiment. When he had heard that the experiment concerned shock and sexual arousal, he thought that his arousal would be inhibited, but he found, much to his surprise, that instead it was enhanced. The subject also reported that during the NS condition he was relaxing from the possibility of getting a shock and noticed that he was less aroused. The CS condition, on the other hand, made him very aware of the light, and because he did not want a shock he used additional fantasies to increase his arousal.

Finally, individual correlations of penile circumference changes and subjective arousal, as reflected by changes in the cognitive lever, were computed for each of the three conditions. These were transformed to z scores, and analysis of covariance was computed with the maximum amount of penile circumference change as the covariant. Maximum arousal was controlled in this way because of prior research indicating that subjective and objective measures of arousal correlate more highly at higher levels of tumescence (Bancroft, 1971; Wincze et al., 1980). This analysis yielded a nonsignificant trend ($p < .10$) reflecting lower individual correlations in the NS condition than in either of the two shock-threat conditions. The average correlation during the NS condition was .68, but it was .83 during the NCS condition and .89 during the CS condition.

Discussion

These data seem to demonstrate that anxiety can facilitate sexual arousal; they agree with other clinical and experimental reports that note similar results (e.g., Barfield & Sachs, 1968; Ramsey, 1943).

Social–psychological work that has examined misattribution in the area of romantic attraction is also in agreement with these findings. For example, Dutton and Aron (1974) examined the effects of anxiety on interpersonal attraction by administering Thematic Apperception Test (TAT) cards to college males after the students crossed either a swaying suspension bridge or a stable, wooden bridge. The anxiety condition (suspension bridge) resulted in more sexual imagery on the TAT, and when met by a female confederate, subjects were more likely to take her phone number and call her about the exper-

iment if they crossed the swaying bridge than if they crossed the stable wooden bridge. While this work is controversial and subject to many qualifications (e.g., Byrne et al., Note 1), it does seem to be a reasonable theoretical context for these data.

These data are also consistent with a variety of data that now exist demonstrating that subjects can suppress or increase their sexual arousal by instructions alone, when asked to do so (e.g., Abel, Barlow, Blanchard, & Mavissakalian, 1975; Henson & Rubin, 1971; Laws & Rubin, 1969; Beck, Barlow & Sakheim, Note 2). Similarly, the biofeedback experiments mentioned in this discussion also reflect the fact that subjects can increase erections when trying to. Thus, it is possible that our subjects, like the ones in the previous experiments, were able to increase their arousal simply because we asked them to. This finding seems to confirm the strong influence of cognitive processes on sexual arousal.

The implications of these data for the maintenance of erectile dysfunction are, of course, not clear at this time since these instructions have not been administered to males with erectile dysfunction. However, there are some data with an indirect bearing on this issue. Mathews (1982), when reinterpreting the findings of an earlier study (Carney, Bancroft, & Mathews, 1978), concluded that administering an anxiolytic agent, diazepam, during the treatment of sexual dysfunction actually inhibited progress rather than enhancing it or having no effect. Mathews' finding does not support the hypothesis that anxiety is responsible for sexual dysfunction and that reducing anxiety should be an object of treatment.

Finally, the trend toward higher correlations between objective and subjective arousal during the shock-threat conditions, although not statistically significant, is potentially interesting and worth further inquiry. It seems that each of the shock-threat conditions did focus subjects' attention on their arousal, so that their subjective estimates of their objective arousal were more accurate than in the no-shock-threat condition irrespective of overall levels of objective sexual arousal. This type of accurate "tracking" of arousal also distinguishes functional males from dysfunctional males, who seem quite a bit less skillful at estimating their objective arousal (e.g., Beck et al., Note 2), suggesting, once again, a role for cognitive factors in sexual dysfunction.

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